



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

REPLY TO
ATTN OF: MLO

14 NOV 1972

MEMORANDUM

TO: Distribution

FROM: ML/Director, Skylab Program

SUBJECT: Operations Directive Change

Enclosed are updated pages to the Skylab Operations Directive, Program Directive No. 43B. Also enclosed is a change log sheet for recording this and subsequent changes. All holders of the document are requested to insert the new pages in their copies of the Operations Directive.

A handwritten signature in dark ink, reading "William C. Schneider". The signature is stylized with a large, looped "S" and a prominent "W".

William C. Schneider

Enclosure

Distribution: see attached list

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OPERATIONS DIRECTIVE CHANGE LOG

As of 11/10/72

CP* No.	SCN** No.	Date	Pages Affected	Comments
1	8	6/1/72	A-4, A-12, (change) A-13 (new)	T025 Mission Assignment/ Scheduling Instruction Changes
2	9	8/11/72	A-10 (change)	S019 Mission Assignment/ Scheduling Instruction Changes
3	10	9/20/72	2-4 (change)	Revision of crew-attended ATM operations scheduling guideline for mission SL-2.
	12	11/10/72	A-4, A-9 (change)	Deletion of M554 from Annex A.
	13	11/10/72	A-4 (change) A-4a (new) A-6, A-8, A-9 (change) A-9a (new) A-10 thru A-12 (change)	Inclusion of M518 and the eleven related corollary experiments (M556-M566). (realignment of FSP's in Table A-2.)
	14	11/10/72	2-5, 2-6 (change)	Revision of Minimum Scheduling Requirements for experiments assigned to Mission SL-1/SL-2 and criteria used for sched- uling candidate experiments.
	15	11/10/72	A-4a, A-12 (change)	Revision of experiment T027 Mission assignment in Annex A.
	16	11/10/72	2-5, 3-4, 4-5, A-4a A-13 (change) A-14 (new)	Inclusion of all the approved student investigations.
	17	11/10/72	2-4, 3-4 (change)	EREP calibration requirements.

* Change Package - Change to Skylab Program Directive No. 43B, transmitted directly to holders of the document.

** Specification Change Notice - Notice of change transmitted through CCB channels per Skylab Program Directive No. 34. The original issue of SLPD 43 is the baseline for SCN numbers; SCN's 1-7 were incorporated in SLPD 43B.

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DEFINITIONS

The following are approved definitions of terms used in this and other Skylab Program documents.

Abort	Mission termination by unscheduled but intentional separation of the spacecraft from the launch vehicle prior to orbital insertion.
Baseline Requirement for Experiments	The highest level of experiment performance required by this directive as limited in text and tables. (When explicit instructions are not given, those documented in the MRD shall apply.)
Category	A degree of importance assigned to a space vehicle element or operational support element. Specific categories applicable to Mission Rules are "Mandatory" and "Highly Desirable".
Constraint	A restriction that influences the mission profile, or timeline, and for mission planning purposes cannot be violated.
Corollary Experiments	The experiments other than group-related and passive experiments that require significant in-flight crew support and which are not as closely related to each other as are the group-related experiments.
Countdown	The period of time commencing with start of the official countdown clock. For Launch Mission Rules purposes, task accomplishment during the interval of time prior to start of the official countdown clock is not generally considered time critical.
Cutoff	The automatic or manual command to stop the launch sequence after initiation of the "automatic launch sequence".

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DEFINITIONS (Continued)

Detailed Test Objective . . . Scientific, engineering, or operational objectives which amplify mission objectives or detail a major development purpose or feature of the mission. The accomplishment of a Detailed Test Objective will be an important consideration in determining the degrees of achievement of the mission objectives.

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- (16) Where possible, all manual abort requests from the ground during flight will be based on two independent indications of the failure. Crew abort action will normally be based upon two cues.
- (17) The S-IVB stages of the SL-2, SL-3, SL-4 and SL-R launch vehicles shall be capable of controlled deorbit by means of controlled dumping of residual propellant.

1.4.3 Skylab Launch Dates

Close adherence to the currently scheduled Skylab launch dates is essential to obtaining the desired seasonal earth resources data. Any experiment, including individual EREP experiments, which could compromise the April 30, 1973 launch date of SL-1 by not meeting the SWS closeout date, will be subject to review by the Program Director for possible cancellation.

1.4.4 Air-to-Ground Voice Communications (TBD)

1.5 DOCUMENTATION

This section has three purposes: (1) to identify key Skylab program and mission documents which include and/or reflect the Program Director's management instructions pertaining to mission planning, requirements, operations and evaluation; (2) to establish responsibilities for the control and orderly development of the Skylab operational documents; and (3) to clarify the relationships that exist among the documents. Figure 1 depicts these documents and their interrelationships.

1.5.1 Mission Requirements Document (MRD)

The MRD is the basis for Skylab mission planning and design. It defines the mission requirements and the functional and performance requirements for implementing the program and mission objectives specified in this Directive. The MRD contains detailed operational requirements for the missions compiled from various sources, including Experiment Requirements Documents (ERDs) and Data Request Forms (DRFs), which are developed at MSC and MSFC. The MRD shall be consistent with this Directive and shall further amplify the mission objectives and requirements set forth herein. To make the relationship of the MRD to the Operations Directive (OD) clear at all times, each issue of the MRD shall include flag sheets to identify all areas in which the MRD is not consistent with the OD. The MRD shall be jointly prepared and approved by MSC and MSFC, and shall be coordinated under the cognizance of the Mission Requirements Panel, as established in reference 4.

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1.5.6 Experiments Requirements Document (ERD)

All Skylab ERD's are established and written under the Skylab Program Specification (reference 3). Thus the formal objectives of each experiment are stated in and controlled through the Program Specification. However, the assignment of experiments to particular missions, and the extent to which each experiment shall be performed on each mission, are controlled by the Program Director through the Operations Directive.

1.6 Mission Management

The extended duration of the Skylab missions, the complexity and number of mission activities, and the increased emphasis of sponsoring office involvement in Skylab has required the establishment of management support groups to assist the Program Director in resolving and coordinating programmatic and operational issues during the mission period. A Flight Management Team (FMT) will function at MSC during the mission to support and provide guidance to the Flight Operations Team. A Skylab Advisory Group for Experiments (SAGE) will advise the Program Director on major policy issues involving experiments.

1.6.1 Flight Management Team

The FMT will provide a means for the Program Director to receive the advice of all organizations directly involved in carrying out the Skylab missions, and will also provide a means of management communication and coordination among the organizations represented. Specific functions of the FMT will be to:

- (1) Review mission status
- (2) Resolve programmatic issues
- (3) Approve significant deviation to nominal flight planning
- (4) Coordinate appropriate decisions and actions with senior NASA management and other Skylab activities

The FMT will be chaired by the Program Director. Other team members will be the MSC Skylab Program Manager, MSFC Skylab and Saturn Program Managers, KSC Skylab Program Manager, MSC Director of Flight Operations, and MSC Director of Flight Crew Operations. Various elements of the operational team may participate as approved by the Program Director. The meetings will be held as directed by the Program Director or his representative. The Flight Director will coordinate and provide for appropriate mission briefings.

1.6.2 Skylab Advisory Group for Experiments

The SAGE will advise the Skylab Program Director on major policies and activities associated with the conduct of experiments. It will provide a forum for the various sponsoring offices to remain current with mission activities, discuss problems with other sponsoring offices and provide recommendations to the Program Director. The members of the SAGE will be the Directors from the NASA Headquarters sponsoring offices of the Skylab experiments. The members are:

- Skylab Program Director - Chairman
- Director Physics & Astronomy Programs
- Director Earth Observation Programs
- Director Manned Space Technology
- Director of NASA Life Sciences
- Director Advanced Missions

The SAGE will meet weekly and as required during the manned mission period. The Program Director or his representative will conduct these meetings. The Headquarters Program Office will support the SAGE by providing current mission status, reviewing future planning and developing available experiment data as requested. Meetings will be conducted in the Skylab Management Center.

2.3.2 Launch Operations

The following requirements shall be reflected in the Launch Mission Rules and other SL-1/SL-2 launch planning documentation:

- (1) Any space vehicle element or operational support element whose malfunction can result in the failure of the SWS to achieve a fully deployed and stabilized attitude, and to remain habitable throughout the planned SL-1/SL-2, SL-3, and SL-4 mission sequence, shall be considered a mandatory item for SL-1 launch.
- (2) Any SL-2 space vehicle element or operational support element whose malfunction can limit the SL-2 manned flight to less than 28 days duration shall be considered a mandatory item for launch.

2.3.3 In-Flight Operations

The following requirements and instructions shall be used in developing the SL-1/SL-2 mission flight plans:

- (1) Approximately one of every seven manned mission-days shall be scheduled as an off-duty day.
- (2) Each off-duty day shall include performance of experiments M071 and M073, crew rest and recreation, nominal monitoring of spacecraft systems, and crew planning.
- (3) Scheduling of crew activities shall permit rapid crew response to solar flares that may occur when the ATM console is not manned.
- (4) To preserve urine samples, the SL-2 crew shall have access to the activated SWS urine freezer within 24 hours of CSM launch. In any event, all feces and samples of all urine voided after SL-2 liftoff shall be processed in the SWS Waste Management System as soon as it becomes available for use.
- (5) The Skylab Educational Program requires video participation by the crew. An average of one crew man-hour per week will be allocated to the preparation for TV coverage of selected experiments and other crew member activities. In addition, a TV tour of the orbital assembly, TV coverage of a press conference, and TV coverage of the EVA activities will be scheduled. These will be supplemented with TV coverage obtained from other selected operational activities such as Earth and solar observations.

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2.3.4 Experiments, Student Investigations, and Subsystems/
Operational Tests

This section contains requirements and instructions for scheduling inflight experiments and subsystems/operational tests in the mission flight plan. Mission assignments and complementary scheduling requirements are given in Annex A, "Skylab Experiments".

2.3.4.1 Pre-Mission Planning

Instructions set forth in the subsections below shall be used for preparing the pre-mission flight plans.

2.3.4.1.1 Group-Related Experiments

The group-related experiments comprise the in-flight medical, ATM, and EREP experiments. They shall be scheduled in accordance with the assignment and scheduling instructions presented in Table A-2 of Annex A, and the requirements set forth below:

- (1) Crew-attended ATM operations shall be given scheduling priority for one crewman, exclusive of those periods allocated to EREP, for all daylight passes (plus the necessary night periods) for all identified experiment days. In no case shall the ATM be scheduled for less than 105 daylight hours, excluding ATM checkout, above the 400 kilometer observing constraint.
- (2) Unattended ATM operations may be scheduled during any period in which the ATM console is not manned, provided such scheduling does not contradict other requirements specified in this document.
- (3) The ATM experiments (excluding S055) and H-alpha I shall each utilize not more than one magazine of film.
- (4) The EREP experiments, excluding S190B, shall be scheduled for operation on 15 EREP passes. There will be 14 Z-local vertical passes and 1 solar inertial pass. Calibration requirements must be satisfied on the solar inertial pass.
- (5) The S190B experiment shall be scheduled for operation on ten of the Z-local vertical passes identified in (4) above.

2.3.4.1.2 Corollary Experiments

The corollary experiments are those inflight experiments other than the group-related experiments and the student investigations. They shall be scheduled in accordance with the instructions set forth in Section 2.3.4.1.5 below.

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2.3.4.1.3 Student Investigations

A number of investigations selected from a national contest of the Skylab Student Project will be performed aboard the orbital assembly. Several of these investigations will be assigned to the SL-1/SL-2 mission. For those experiments that require crew support a flight scheduling precedence (FSP) will be assigned and shall be scheduled per the instructions given in Section 2.3.4.1.5 below.

2.3.4.1.4 Subsystems/Operational Tests

Subsystems/operational tests for Mission SL-1/SL-2 will be approved at Level II and subsequently documented as Detailed Test Objectives (DTO's) in the Mission Requirements Document (MRD). Each DTO shall clearly indicate whether the test is (1) mandatory with respect to crew safety or mission objectives or (2) non-mandatory. Those tests deemed mandatory shall be incorporated into either systems house-keeping, experiment preparation, or other life/systems support activities as appropriate. These tests deemed non-mandatory shall be scheduled on a non-interference basis with experiments, student investigations and mandatory tests.

2.3.4.1.5 Scheduling of Corollary Experiments and Student Investigations

Corollary experiments and student investigations shall be scheduled on Mission SL-1/SL-2 in accordance with the following instructions.

- (1) Corollary experiments and student investigations assigned to Mission SL-1/SL-2 shall be scheduled into those intervals of the crew timeline which have not been allocated to the group-related experiments and the necessary life/systems support activities (eat, sleep, off-duty, personal hygiene, and systems housekeeping). The corollary experiments and student investigations shall be scheduled to satisfy the requirements stated or implied in Table A-2 of Annex A. If these requirements cannot be fully accommodated in the mission timeline, the following experiments may be reduced to not less than the level shown:

<u>Experiment</u>	<u>Minimum Scheduling Requirement</u>
M509	Perform one suited set of maneuvers.
S019	Eight night passes of 32 minutes average length. (~ 100 photographic exposures)

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<u>Experiment</u>	<u>Minimum Scheduling Requirement (Cont'd)</u>
S183	Eight night passes of 32 minutes average length. (~25 photographic exposures)
T025	Perform three observation periods of one orbit each.
T027 (SA)	Deploy sample array for a 72-hour period.
T027/S073	Perform 15 program performances (photometer scans).
T003	Reduce that portion of the experiment that requires daily performance, to performance every other day.
D008	Accomplish one performance of each active survey. (Five passive dosimeters are automatically exposed.)
M487	Perform group discussion evaluations, and obtain instrument and photographic data.

The experiments listed above shall be considered for reduction in order of increasing flight scheduling precedence; e.g., an experiment of FSP 200 will be considered for reduction before an experiment of FSP 300. It is recognized, however, that the order in which experiments are actually reduced may depend more on operational considerations than on the FSP. The SL-1/SL-2 flight plan shall be flagged to indicate which experiments or investigations have been scheduled to less than their full requirements. The Program Director will consider further reduction if necessary.

- (2) Candidate experiments may be scheduled on the mission provided this does not require scheduling the assigned experiments to less than their baseline requirements. They will be considered for inclusion in the timeline in order of decreasing FSP.
- (3) The joint T027/S073 program of photometer scans shall be scheduled to begin early in the mission, before the initiation of the ATM experiments. This does not mean, however, that the start of ATM operations is in any way contingent upon the performance or results of T027/S073.

2.3.4.2 Real-Time Planning of Experiment Activities

The guidelines in this section shall govern real-time flight planning of experiment activities during conduct of the SL-1/SL-2 mission. The real-time goal shall be performance of the baseline requirements as defined in the Appendix. Priority for attainment of the baseline requirements is group related experiments followed by corollary experiments and student investigations in order of decreasing FSP.

2.3.4.2.1 Increased Scheduling

In general, no increase in scheduling beyond baseline requirement will be approved for an experiment until all other assigned or candidate experiments are scheduled to the maximum extent possible toward their baseline requirements. Candidate experiments will be scheduled if their performance will not preclude attainment of baseline requirements of assigned experiments capable of performance.

2.3.4.2.2 Reduced Scheduling

When real-time flight planning indicates that assigned experiments may not attain minimum scheduling requirements (or baseline requirements if minimum scheduling requirements have not been established), experiments will be considered for further reduction and/or cancellation in sequence of increasing FSP and other operational constraints. The Flight Management Team will be briefed on plans for reduction and/or cancellation prior to their implementation. Performance redlines, established below, represent levels of minimum worthwhile information for experiments. Performances of less than redline will not be scheduled.

<u>Experiment</u>	<u>Performance Redline Scheduling Requirement (SL-1/SL-2)</u>
M415	No crew time required.
All Medical	Continue to schedule toward baseline requirements; however, repetitive performance of medical experiments may, with flight surgeon concurrence, be deferred to permit performance of ATM and EREP contingency requirements.
All ATM	Continue to schedule toward baseline requirements. (The required redline performance is to checkout and operate all hardware to verify operational capability. EVA data retrieval shall be a real-time decision.)
All EREP	Continue to schedule toward baseline requirements. (The required redline performance is one Z-local vertical pass or a solar inertial pass to validate the data system.)
D008	Perform two active dosimeter surveys. (Five passive dosimeters are automatically exposed.)
D024	Continue to schedule toward baseline requirements.

<u>Experiment</u>	<u>Performance Redline Scheduling Requirements (SL-1/SL-2)</u>
M509	Perform one unsuited set of maneuvers.
M516	No crew time required.
M551, M552, M553	Perform operation on one specimen.
M555	Continue to schedule toward baseline requirement.
S009, S015	Activate for duration of mission.
S019	Perform one night pass (12 exposures).
S020	Perform one orbital run for calibration data and feasibility check for simultaneous S020/ATM operation.
S149	Schedule toward baseline requirement.
S183	Perform one night pass (13 exposures).
S228	Continue to schedule toward baseline requirement.
T003	Perform a set of initial measurements and repeat one measurement, twice during the mission.
T025	Perform one data taking orbit.
T027SA	Schedule toward baseline requirement.
T027/S073	Perform one contamination data scan and one system monitor scan.
ED 11, 12, 22	No crew time required.
ED 23, 26	No performance unless time will permit one performance in conjunction with S019.
ED 31	Perform the inoculation session and one photography session.
ED 76	Deploy, retrieve, and return one neutron flux detector.

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3.3.4.1 Pre-Mission Planning

Instructions set forth in the subsections below shall be used for preparing the pre-mission flight plans.

3.3.4.1.1 Group-Related Experiments

The group-related experiments comprise the in-flight medical, ATM, and EREP experiments. They shall be scheduled in accordance with the assignment and scheduling instructions presented in Table A-2 of Annex A, and the requirements set forth below:

- (1) Crew attended ATM operations shall be scheduled to obtain a minimum of 230 solar data-taking hours. (The ATM has priority for one crewman for an average of 10 hours per day except for off-duty and EVA days; however, this does not preclude his performance of other tasks on a non-interference basis.)
- (2) Unattended ATM operations may be scheduled during any period in which the ATM console is not manned, provided such scheduling does not contradict other requirements specified in this document.
- (3) The ATM experiments (excluding S055) and H-alpha I shall each utilize not more than two magazines of film.
- (4) Scheduling requirements for the EREP experiments are not firmly established. For planning purposes the following guidelines shall be utilized: The EREP experiments, excluding S190B, shall be scheduled for operation on 26 Z-local vertical passes and two solar-inertial passes; the S190B experiment shall be scheduled for operation on at least 20 of the Z-local vertical passes identified above.

3.3.4.1.2 Corollary Experiments

The corollary experiments are those inflight experiments other than the group-related experiments and the student investigations. They shall be scheduled in accordance with the instructions set forth in Section 3.3.4.1.5 below.

3.3.4.1.3 Student Investigations

A number of investigations selected from a national contest of the Skylab Student Project will be performed aboard the orbital assembly. Several of these investigations will be assigned to the SL-3 mission. For those experiments that require crew support a flight scheduling precedence (FSP) will be assigned and shall be scheduled per the instructions given in Section 3.3.4.1.5 below.

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3.3.4.1.4 Subsystems/Operational Tests

Subsystems/operational tests for Mission SL-3 will be approved at Level II and subsequently documented as Detailed Test Objectives (DTO's) in the Mission Requirements Document (MRD). Each DTO shall clearly indicate whether the test is (1) mandatory with respect to crew safety or mission objectives or (2) non-mandatory. Those tests deemed mandatory shall be incorporated into either systems housekeeping, experiment preparation, or other life/systems support activities as appropriate. Those tests deemed non-mandatory shall be scheduled on a non-interference basis with experiments, student investigations and mandatory tests.

3.3.4.1.5 Scheduling of Corollary Experiments and Student Investigations

Corollary experiments and student investigations shall be scheduled on Mission SL-3 in accordance with the following instructions.

- (1) Corollary experiments and student investigations assigned to Mission SL-3 shall be scheduled into those intervals of the crew timeline which have not been allocated to the group-related experiments and the necessary life/systems support activities (eat, sleep, off-duty, personal hygiene, and systems housekeeping). The corollary experiments and student investigations shall be scheduled to satisfy the requirements stated or implied in Table A-2 of Annex A.
- (2) Candidate experiments may be scheduled on the mission providing this does not impact the assigned experiments. They will be considered for inclusion in the timeline in order of decreasing FSP.

3.3.4.2 Real-Time Planning of Experiment Activities

The guidelines in this section shall govern real-time flight planning of experiment activities during conduct of the SL-3 mission. The real-time goal shall be performance of the baseline requirements as defined in the Appendix. Priority for attainment of the baseline requirements is group related experiments followed by corollary experiments and student investigations in order of decreasing FSP.

3.3.4.2.1 Increased Scheduling

In general, no increase in scheduling beyond baseline requirements will be approved for an experiment until all other assigned or candidate experiments are scheduled to the maximum extent possible toward their baseline requirements. Candidate experiments will be scheduled if their performance will not preclude attainment of baseline requirements of assigned experiments capable of performance.

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3.3.4.2.2 Reduced Scheduling

When real-time flight planning indicates that assigned experiments may not attain minimum scheduling requirements (or baseline requirements if minimum scheduling requirements have not been established), experiments will be considered for further reduction and/or cancellation in sequence of increasing FSP and other operational constraints. The Flight Management Team will be briefed on plans for reduction and/or cancellation prior to their implementation. Performance redlines, established below, represent levels of minimum worthwhile information for experiments. Performance of less than redline will not be scheduled.

<u>Experiment</u>	<u>Performance Redline Scheduling Requirement (SL-3)</u>
TBD	TBD

3.3.5 Unmanned Operations

- (1) The following guidelines apply to the unmanned period of SWS operations between separation of the SL-2 CSM and docking of the SL-3 CSM.
 - (a) The SWS shall be controlled and interrogated from the ground during the unmanned period.
 - (b) Film for ATM experiments S052 and S054 shall be loaded during the end-of-mission SL-2 EVA for exposure during the unmanned period of SL-3. This film will remain in the experiment canisters until the mid-mission SL-3 EVA. No film shall be provided beyond that specified in Table A-2 of Annex A.
- (2) The unmanned period that follows separation of the SL-3 CSM from the SWS will be part of Mission SL-4.

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4.3.4.1.3 Student Investigations

A number of investigations selected from a national contest of the Skylab Student Project will be performed aboard the orbital assembly. Several of these investigations will be assigned to the SL-4 mission. For those experiments that require crew support a flight scheduling precedence (FSP) will be assigned and shall be scheduled per the instructions given in Section 4.3.4.1.5 below.

4.3.4.1.4 Subsystems/Operational Tests

Subsystems/operational tests for Mission SL-4 will be approved at Level II and subsequently documented as Detailed Test Objectives (DTO's) in the Mission Requirements Document (MRD). Each DTO shall clearly indicate whether the test is (1) mandatory with respect to crew safety or mission objectives or (2) non-mandatory. Those tests deemed mandatory shall be incorporated into either systems housekeeping, experiment preparation, or other life/systems support activities as appropriate. Those tests deemed non-mandatory shall be scheduled on a non-interference basis with experiments, student investigations and mandatory tests.

4.3.4.1.5 Scheduling of Corollary Experiments and Student Investigations

Corollary experiments and student investigations shall be scheduled on Mission SL-4 in accordance with the following instructions.

- (1) Corollary experiments and student investigations assigned to Mission SL-4 shall be scheduled into those intervals of the crew timeline which have not been allocated to the group-related experiments and the necessary life/systems support activities (eat, sleep, off-duty, personal hygiene, and systems housekeeping). The corollary experiments and student investigations shall be scheduled to satisfy the requirements stated or implied in Table A-2 of Annex A.
- (2) Candidate experiments may be scheduled on the mission provided this does not impact the assigned experiments. They will be considered for inclusion in the timeline in order of decreasing FSP.

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4.3.4.2 Real-Time Planning of Experiment Activities

The guidelines in this section shall govern real-time flight planning of experiment activities during conduct of the SL-4 mission. The real-time goal shall be performance of the baseline requirements as defined in the Appendix. Priority for attainment of the baseline requirements is group related experiments followed by corollary experiments and student investigations in order of decreasing FSP.

4.3.4.2.1 Increased Scheduling

In general, no increase in scheduling beyond baseline requirement will be approved for an experiment until all other assigned or candidate experiments are scheduled to the maximum extent possible toward their baseline requirements. Candidate experiments will be scheduled if their performance will not preclude attainment of baseline requirements of assigned experiments capable of performance.

4.3.4.2.2 Reduced Scheduling

When real-time flight planning indicates that assigned experiments may not attain minimum scheduling requirements (or baseline requirements have not been established), experiments will be considered for further reduction and/or cancellation in sequence of increasing FSP and other operational constraints. The Flight Management Team will be briefed on plans for reduction and/or cancellation prior to their implementation. Performance redlines, established below, represent levels of minimum worthwhile information for experiments. Performance of less than redline will not be scheduled.

Experiment Performance Redline Scheduling Requirement (SL-4)

TBD

TBD

4.3.5 Unmanned Operations

- (1) The following guidelines apply to the unmanned period of SWS operations between separation of the SL-3 CSM and docking of the SL-4 CSM.
 - (a) The SWS shall be controlled and interrogated from the ground during the unmanned period.
 - (b) Film for ATM experiments S052 and S054 shall be loaded during the end-of-mission SL-3 EVA for exposure during the unmanned period of SL-4. This film will remain in the experiment canisters until the end-of-mission SL-4 EVA. No film shall be provided beyond that specified in Table A-2 of Annex A.
- (2) Guidelines for SWS operations following separation of the SL-4 CSM are TBD.

- (7) Normal launch preparation activities of the baseline mission CSM and Saturn IB space vehicles shall be conducted until a decision to implement a rescue mission is made. At that point, modification of the CSM and accelerated launch operation activities shall be initiated. Capability shall be provided to install the CSM modification kit at KSC after the rescue mission decision has been made. Modification of the fourth CSM for rescue capability shall be accomplished at an earlier point since this vehicle is not a part of the baseline mission sequence.

5.3.2 Mission Commit Policies and Requirements

- (1) Criteria for initiating a rescue mission shall be included in the Flight Mission Rules of each Skylab mission.
- (2) The decision to proceed with preparation of the Rescue Mission space vehicle will be made by the Program Director.
- (3) The decision to initiate the Rescue Mission will be made by the Associate Administrator for Manned Space Flight.

5.4 PLANNING REQUIREMENTS

Skylab rescue plans shall be developed by KSC and MSC. The purpose of these plans is to define the requirements, activities and schedules associated with the operational planning and conduct of the rescue mission. Each Center shall submit its Rescue Plan to the Program Director not later than eight months prior to the SL-1 launch date.

5.5 EXPERIMENT DATA RETURN GUIDELINES

The following guidelines are to be used for advance planning and for realtime experiment return selection. The guidelines are divided into two categories; General and Specific. The general guidelines present the approach to be used in the selection of experiment data. The specific guidelines present rules that affect specific experiment groups or specific experiments. For the purpose of the guidelines, the experiment groups are considered to be Medical, ATM, EREP, and Corollary. The Specific Guidelines are considered to be the baseline experiment return package based on nominal experiment accomplishment. The specific rules will be updated after each mission to reflect actual mission accomplishments. In the event of a rescue mission, the Program Director may alter the baseline Specific Guidelines to meet the actual mission and experiment situations. The Program Director will review and approve the experiment data return package.

5.5.1 General Guidelines

- (1) Reductions from nominal return affects all experiment groups.
- (2) Select data to maximize scientific return with each experiment group rather than maximizing return of single experiments.
- (3) Selection of data will consider:
Quantity and quality of data on previous missions; quality of data on the present mission; data return of the present mission by alternate means (telemetry, voice, TV); expected return on any subsequent missions.
- (4) Experiment data that is not selected for return on a rescue mission will be considered for return on any subsequent missions.

5.5.2 Specific Guidelines

Guidelines apply to all missions unless otherwise noted.

(1) Medical

- (a) Select data to maximize information of the status of the crew's health and well being.
- (b) A nominal weight of 115 lbs. is allowable for urine chiller and contents. The urine chiller will not be returned on a SL-4 rescue if an alternate data return package has a greater scientific return.
- (c) Up to a nominal weight of 50 lbs. of other medical data will be returned. This will be reduced to 40 lbs. on SL-4.
- (d) If unable to return ATM film, the 50 and 40 lb. limits above will be increased by 15 lbs.

(2) ATM

- (a) Up to a nominal weight of 65 lbs. of ATM film will be returned.

(3) EREP

- (a) A nominal weight of 40 lbs. of EREP film and tape shall be returned. On SL-4 this limit is raised by 10 lbs.
- (b) If unable to return ATM film, then an additional 15 lbs. of EREP film and tape will be returned.

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(4) Corollary and Student

- (a) Corollary and Student Experiment Data will use weight and volume not occupied by the Medical, ATM, and EREP experiment groups.
- (b) Data will be selected to maximize the number of experiments taken in descending order of FSP.
- (c) On applicable missions, if unable to return ATM data, S020 data shall be returned.

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SKYLAB EXPERIMENTS

<u>Experiment</u>	<u>Mission Assignment</u>		
	<u>SL-1/SL-2</u>	<u>SL-3</u>	<u>SL-4</u>
<u>Corollary</u>			
D008 - Radiation in Spacecraft	A		
D024 - Thermal Control Coatings	A	C	C
M479 - Zero Gravity Flammability (Revised)			A
M487 - Habitability/Crew Quarters	A	A	A
M509 - Astronaut Maneuvering Equipment	A	A	A
M516 - Crew Activities/Maintenance	A	A	A
**M551 - Metals Melting	A		
**M552 - Exothermic Brazing	A		
**M553 - Sphere Forming	A		
**M555 - Gallium Arsenide Crystal Growth	A		
ΔM556 - Vapor Growth of II-VI Compounds			A
ΔM557 - Immiscible Alloy Compositions			A
ΔM558 - Radioactive Tracer Diffusion			A
ΔM559 - Microsegregation in Germanium			A
ΔM560 - Growth of Spherical Crystals			A
ΔM561 - Whisker-Reinforced Composites			A
ΔM562 - Indium Antimonide Crystals			A
ΔM563 - Mixed III-V Crystal Growth			A
ΔM564 - Metal and Halide Eutectics			A
ΔM565 - Silver Grids Melted in Space			A
ΔM566 - Copper-Aluminum Eutectics			A
S009 - Nuclear Emulsion	A		
S015 - Zero Gravity Single Human Cells	A		
S019 - UV Stellar Astronomy	A	C	C
S020 - UV/X-Ray Solar Photography	A	A	A
S063 - UV Airglow Horizon Photography		C	C
S149 - Particle Collection	A	A	A
S183 - UV Panorama	A	C	C
S228 - Trans-Uranic Cosmic Rays	A		A
S230 - Magnetospheric Particle Composition		A	A

LEGEND:

C - The experiment, or a part of the experiment, is a candidate for performance on this mission, provided the requirements set forth in Table A-2 will not have been satisfied on an earlier mission (or missions).

** - These experiments utilize a common facility, M512-Materials Processing Facility.

A - These experiments utilize a common facility, M518-Multipurpose Electric Furnace.

Table A-1: Summary of Experiment Mission Assignments

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SKYLAB EXPERIMENTS

<u>Experiment</u>	<u>Mission Assignment</u>		
	<u>SL-1/SL-2</u>	<u>SL-3</u>	<u>SL-4</u>
<u>Corollary (Cont'd)</u>			
T002 - Manual Navigation Sightings (B)	C	C	C
T003 - In-Flight Aerosol Analysis	A	A	A
T013 - Crew Vehicle Disturbance		C	C
T020 - Foot-Controlled Maneuvering Unit		A	A
T025 - Coronagraph Contamination Measurement	A	A	A
T027 (SA) - Contamination Measurement (Sample Array)	A		
T027/S073 - Contamination Measurement Gegenschein/Zodiacal Light (Photometer)	A	A	A

Student Investigations

ED11 - Earth's Absorption of Radiant Heat	A	C	C
ED12 - Volcanic Study	A	C	C
ED21 - Libration Clouds		A	
ED22 - Objects in Mercury's Orbits	A	C	C
ED23 - UV From Quasars	A		
ED24 - X-Ray Stellar Classes			A
ED25 - X-Rays From Jupiter		A	
ED26 - UV From Pulsars	A		
ED31 - Bacteria and Spores	A		
ED32 - In-Vitro Immunology		A	
ED41 - Motor Sensory Performance			A
ED52 - Web Formation		A	
ED61/62 - Plant Growth/Plant Phototropism			A
ED63 - Cytoplasmic Streaming in Zero "G"		A	
ED72 - Capillary Study			A
ED74 - Mass Measurement		A	
ED76 - Neutron Analysis	A	A	A
ED78 - Liquid Motion in Zero "G"			A

LEGEND:

C - The experiment, or a part of the experiment, is a candidate for performance, on this mission, provided the requirements set forth in Table A-2 will not have been satisfied on an earlier mission (or missions).

Table A-1: Summary of Experiment Mission Assignments

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EXPERIMENT GROUP	EXPERIMENT NUMBER	EXPERIMENT TITLE	MISSION ASSIGNMENTS/SCHEDULING INSTRUCTIONS	FSP
MEDICAL	M071 -	Mineral Balance	These experiments are assigned to Missions SL-1/SL-2, SL-3, and SL-4	N/A
	M073 -	Bioassay of Body Fluids		
	M074 -	Specimen Mass Measurement		
	*M078 -	Bone Mineral Measurement		
	M092 -	In-flight Lower Body Negative Pressure	* These experiments have pre- and post-flight requirements only.	
	M093 -	Vectorcardiogram		
	*M111 -	Cytogenetic Studies of Blood		
	M112 -	Man's Immunity - In vitro aspects		
	M113 -	Blood Volume and Red Cell Life Span		
	M114 -	Red Blood Cell Metabolism		
	M115 -	Special Hematologic Effects		
	M171 -	Metabolic Activity		
	M172 -	Body Mass Measurement		
	M131 -	Human Vestibular Function	This experiment is assigned to Missions SL-1/SL-2 and SL-3.	N/A
	M133 -	Sleep Monitoring	This experiment shall be performed in 15 sleep-sessions on Mission SL-1/SL-2, and in 21 sleep-sessions on Mission SL-3.	N/A
	M151 -	Time and Motion Study	This experiment is assigned to Missions SL-1/SL-2, SL-3, and SL-4. It shall be performed only in conjunction with other experiments.	420

TABLE A-2. Experiment Assignment and Scheduling Instructions

January 5, 1973

EXPERIMENT GROUP	EXPERIMENT NUMBER	EXPERIMENT TITLE	MISSION ASSIGNMENTS/SCHEDULING INSTRUCTIONS	FSP
ATM	S052	White Light Coronagraph	These experiments are assigned to Mission SL-1/SL-2, SL-3 and SL-4. The full requirements in terms of data-taking hours for each mission are identified in the appropriate pre-mission planning sections of this document.	N/A
	S054	X-Ray Spectrographic Telescope	These experiments, excluding S055, shall each utilize not more than:	
	S055	UV Spectrometer (A)	<u>One</u> magazine of film on SL-1/SL-2	
	S056	Dual X-Ray Telescope	<u>Two</u> magazines of film on SL-3	
	S082	UV Spectrograph/Heliograph	<u>One</u> magazine of film on SL-4	
EREP	S190	Multispectral Photographic Facility	These experiments are assigned to Missions SL-1/SL-2, SL-3, and SL-4.	N/A
	S190A	Multispectral Photographic Cameras	With the exception of S190B, they shall be scheduled for operation on a total of 60 Z-local vertical passes and five solar-inertial passes.	
	S190B	Earth Terrain Camera	The S190B experiments shall be scheduled for operation on a minimum of 45 Z-local vertical passes.	
	S191	Infrared Spectrometer		
	S192	Multispectral Scanner		
	S193	Microwave Radiometer/Scatterometer and Altimeter		
	S194	L-Band Radiometer		

TABLE A-2. Experiment Assignment and Scheduling Instructions

January 5, 1973

EXPERIMENT GROUP	EXPERIMENT NUMBER	TITLE	MISSION ASSIGNMENTS/SCHEDULING INSTRUCTIONS	FSP
COROLLARY	D008 - Radiation in Spacecraft		Four active dosimeter surveys shall be performed on Mission SL-1/SL-2 (the experiment is integrated in CM 116).	220
	D024 - Thermal Control Coatings		Two sample panels shall be retrieved on Mission SL-1/SL-2; the remaining two sample panels shall be retrieved on either SL-3 or SL-4.	230
	M479 - Zero Gravity Flammability		A total of five sets of test cycles shall be performed as close to the termination of the SL-4 Mission as possible so as not to contaminate any experiments having sensor equipment external to the spacecraft.	210
	M487 - Habitability/Crew Quarters		This experiment shall be performed on Missions SL-1/SL-2, SL-3, and SL-4.	470
	M509 - Astronaut Maneuvering Equipment		Four experiment runs (three unsuited and one suited) shall be performed during each mission. The same crewman shall perform these four runs during each mission while being accompanied by an observer. At least one crewman who performs M509 shall also perform one set of experiment runs on T020.	300

TABLE A-2. Experiment Assignment and Scheduling Instructions

January 5, 1973

EXPERIMENT GROUP	EXPERIMENT NUMBER	TITLE	MISSION ASSIGNMENTS/SCHEDULING INSTRUCTIONS	FSP
COROLLARY	M516 - Crew Activities/Maintenance		This experiment is assigned to Missions SL-1/SL-2, SL-3, and SL-4. The fine manipulation maintenance tasks shall be performed on Mission SL-4.	380
	M551 - Metals Melting		This experiment is assigned to Mission SL-1/SL-2.	190
	M552 - Exothermic Brazing		This experiment is assigned to Mission SL-1/SL-2.	150
	M553 - Sphere Forming		This experiment is assigned to Mission SL-1/SL-2.	160
	M555 - Gallium Arsenide Crystal Growth		This experiment is assigned to Mission SL-1/SL-2.	200
	M556 - Vapor Growth of II-VI Compounds		This experiment is assigned to Mission SL-4. This experiment shall be the last experiment performed in the M518 facility because of the possible toxicity hazard.	350
	M557 - Immiscible Alloy Composition		This experiment is assigned to Mission SL-4.	440
	M558 - Radioactive Tracer Diffusion		This experiment is assigned to Mission SL-4. This experiment shall be the next to last experiment performed in the M518 facility because of the possible toxicity hazard.	430
	M559 - Microsegregation in Germanium		This experiment is assigned to Mission SL-4.	320

TABLE A-2. Experiment Assignment and Scheduling Instructions

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EXPERIMENT GROUP	EXPERIMENT NUMBER	TITLE	MISSION ASSIGNMENTS/SCHEDULING INSTRUCTIONS	FSP
COROLLARY	M560 - Growth of Spherical Crystals		This experiment is assigned to Mission SL-4.	310
	M561 - Whisker-Reinforced Composites		This experiment is assigned to Mission SL-4.	360
	M562 - Indium Antimonide Crystals		This experiment is assigned to Mission SL-4.	480
	M563 - Mixed III-V Crystal Growth		This experiment is assigned to Mission SL-4.	390
	M564 - Metal and Halide Eutectics		This experiment is assigned to Mission SL-4.	270
	M565 - Silver Grids Melted in Space		This experiment is assigned to Mission SL-4.	260
	M566 - Copper-Aluminum Eutectics		This experiment is assigned to Mission SL-4.	400

TABLE A-2. Experiment Assignment and Scheduling Instructions

January 5, 1973

EXPERIMENT GROUP	EXPERIMENT NUMBER	TITLE	MISSION ASSIGNMENTS/SCHEDULING INSTRUCTIONS	PSP
COROLLARY	S009 - Nuclear Emulsion		One nuclear emulsion detector package shall be exposed and retrieved on Mission SL-1/SL-2.	180
	S015 - Zero Gravity Single Human Cells		This experiment is assigned to Mission SL-1/SL-2 (the experiment hardware is integrated in CM 116).	280
	S019 - UV Stellar Astronomy		One hundred-fifty data exposures, requiring the equivalent of 12 night passes averaging 32 minutes each, shall be obtained on the SL-1/SL-2 mission. Another 150 data exposures requiring the equivalent of 12 night passes averaging 32 minutes each, shall be obtained on either the SL-3 or SL-4 mission.	500
	S020 - UV/X-Ray Solar Photography		This experiment is assigned to all missions. Only one orbital run shall be performed on Mission SL-1/SL-2 and that is for calibration data and to check feasibility of simultaneous S020 and ATM operation. Ten data exposures of the quiet sun and ten data exposures of the active sun shall be obtained on each of the other two missions.	290
	S063 - UV Airglow Horizon Photography		A total of 600 data exposures shall be obtained on Mission(s) SL-3 and/or SL-4.	240

TABLE A-2. Experiment Assignment and Scheduling Instructions

January 5, 1973

EXPERIMENT GROUP	EXPERIMENT NUMBER	TITLE	MISSION ASSIGNMENTS/SCHEDULING INSTRUCTIONS	FSP
COROLLARY	S149 - Particle Collection		Four sets of detector cassettes shall be deployed, exposed, and retrieved. One set shall be exposed during the unmanned portion of Mission SL-3, and one set shall be exposed on the manned portion of SL-3. In addition, one set shall be exposed on the unmanned portion of SL-4, and one set shall be exposed on the manned portion of SL-4.	450
	S183 - UV Panorama		Thirty-five data exposures shall be obtained on Mission SL-1/SL-2; another 35 day exposure shall be obtained on either SL-3 or SL-4.	490
	S228 - Trans-Uranic Cosmic Rays		This experiment is assigned to Mission SL-1/SL-2 for deployment of the Lexan panel. The experiment will be returned on Mission SL-4.	275
	S230 - Magnetospheric Particle Composition		This experiment is assigned to SL-3 and SL-4.	165
	T002 - Manual Navigation Sightings (B)		This experiment shall be performed on one, two, or three missions, at the convenience of the crew and on a non-interference basis with the other experiments.	140
	T003 - In-Flight Aerosol Analysis		This experiment shall be performed on Missions SL-1/SL-2, SL-3 and SL-4.	460
	T013 - Crew/Vehicle Disturbance		This experiment shall be performed in the OWS on either Mission SL-3 or SL-4.	340

TABLE A-2. Experiment Assignment and Scheduling Instructions

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EXPERIMENT GROUP	EXPERIMENT NUMBER	EXPERIMENT TITLE	MISSION ASSIGNMENTS/SCHEDULING INSTRUCTIONS	FSP
COROLLARY	T020	Foot Controlled Maneuvering Unit	Each of two crewmen shall perform a set of five experiment runs (three unsuited and two suited). The experiment shall be performed by one crewman on Mission SL-3 and by another crewman on Mission SL-4. At least one of the crewmen who performs T020 shall also perform one set of experiment runs on M509.	190
	T025	Coronagraph Contamination Measurement	Photographs shall be obtained during five data-taking periods on Mission SL-1/SL-2, during ten data-taking periods on Mission SL-3 and during ten data-taking periods on Mission SL-4. No more than one cassette of film will be exposed during any data-taking period. In addition, one period of visual observations shall be performed on each of the three missions. One photographic data-taking period per mission may be scheduled to coincide with the period of visual observations.	180
	T027(SA)	ATM Contamination Measurement (Sample Array)	One sample array shall be developed, exposed for 120 hours and retrieved on Mission SL-1/SL-2.	350
	T027/S073	ATM Contamination Measurement Gegenschein/Zodiacal Light (Photometer System)	This is a joint experiment utilizing the T027 photometer system. Twenty-three (23) program performances shall be performed on Mission SL-1/SL-2. Forty-five (45) program performances shall be performed on each of Missions SL-3 and SL-4.	340

TABLE A-2. Experiment Assignment and Scheduling Instructions

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EXPERIMENT GROUP	EXPERIMENT NUMBER	EXPERIMENT TITLE	MISSION ASSIGNMENTS/SCHEDULING INSTRUCTIONS	FSP
STUDENT		TBD	See Sections 2.3.4.1.3 3.3.4.1.3 4.3.4.1.3	90

TABLE A-2. Experiment Assignment and Scheduling Instructions

November 10, 1972

EXPERIMENT GROUP	EXPERIMENT NUMBER	EXPERIMENT TITLE	MISSION ASSIGNMENTS/SCHEDULING INSTRUCTIONS	FSP
Student	ED61/62	Plant Growth/Phototropism	Perform this experiment one time in accordance with MRD.	90
	ED63	Cytoplasmic Streaming	Perform this experiment one time in accordance with MRD.	90
	ED72	Capillary Study	Perform this experiment one time in accordance with MRD.	90
	ED74	Mass Measurement	Perform this experiment one time in accordance with MRD.	90
	ED76	Neutron Analysis	Perform this experiment one time in accordance with MRD.	90
	ED78	Liquid Motion	Perform this experiment one time in accordance with MRD.	90

Table A-2. Experiment Assignment and Scheduling Instructions

NASA-HQ